

CLAIMS

1. A liquid crystal display panel comprising a liquid crystal layer filled between a pair of transparent substrates, the liquid crystal display panel further comprising:

a first optical-path changing layer, on a front-face side of a rear-face side transparent substrate, that has a refractive index substantially equal to a refractive index of the rear-face side transparent substrate, and that includes a predetermined protrusion and a predetermined depression, the rear-face side transparent substrate being one of the pair of transparent substrates that is provided on a side which becomes a rear side when an observer views the liquid crystal display panel;

a low refractive-index layer, on a front-face side of the first optical-path changing layer, that is in contact with the predetermined protrusion and the predetermined depression of the first optical-path changing layer, and that has a refractive index that is smaller than the refractive index of the first optical-path changing layer; and

a second optical-path changing layer, on a rear-face side of the rear-face side transparent substrate, that includes a predetermined protrusion and a predetermined depression.

2. The liquid crystal display panel according to Claim 1, further comprising a total-reflection film on a rear-face side of the second optical-path changing layer.

3. The liquid crystal display panel according to Claim 1, further comprising at least one light scattering layer between the pair of transparent substrates.

4. The liquid crystal display panel according to Claim 1, further comprising a transfective reflection film on a front-face side of the low refractive-index layer.

5. A liquid crystal display apparatus including a liquid crystal display panel set forth in any one of Claims 1 to 4, the liquid crystal display apparatus further comprising:

a light source provided on at least one side face of the rear-face side transparent substrate.

6. The liquid crystal display apparatus according to Claim 5, wherein a front-side end part of the light source is provided so as not to protrude, toward a front-face side, from an interface of the rear-face side transparent substrate and

the first optical-path changing layer.

7. A liquid crystal display apparatus comprising a liquid crystal display panel including a liquid crystal layer filled between a pair of transparent substrates, and a light source provided on at least one side face of a rear-face side transparent substrate, the rear-face side transparent substrate being one of the pair of transparent substrates that is provided on a side which becomes a rear side when an observer views the liquid crystal display panel,

the liquid crystal display apparatus comprising:

a boundary surface, on a front-face side of the rear-face side transparent substrate, that includes a predetermined protrusion and a predetermined depression, the boundary surface having (i) a function of carrying out a total reflection with respect to incident light that directly comes from the light source, to change the incident light into light that is closer in a direction of a normal line of a substrate, and (ii) a function of transmitting incident light that is close to the direction of the normal line; and

a reflective surface, on the rear-face side of the rear-face side transparent substrate, that includes a predetermined protrusion and a predetermined depression, the reflective

surface having a function of reflecting incident light that directly comes from the light source, to change the incident light into light that is closer in the direction of the normal line of the substrate.